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ABSTRACT

Two experiments tested the idea that the means by which children acquire efficacy information can produce different levels of task motivation and self-perception of competence. In Experiment 1, children periodically received either ability attributional feedback, effort feedback, ability plus effort feedback, or no attributional feedback. Although the three feedback conditions did not differ in rate of problem solving, ability feedback alone led to the highest self-efficacy and achievement. In Experiment 2, children pursued either difficult or easier performance goals, and received either direct or comparative attainment information. Difficult goals enhanced rate of problem solving; combining difficult goals with direct information resulted in the highest self-efficacy and skill. Collectively, these results support the idea that self-efficacy is an important variable in understanding students' achievement behavior. (Author/PN)

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Paper presented at the annual meeting of the American Educational Research Association, Montreal, April 1983.

Abstract

Two experiments tested the idea that the means by which children acquire efficacy information can produce different levels of task motivation and self-perceptions of competence. In Experiment 1, children periodically received either ability attributional feedback, effort feedback, ability + effort feedback, or no attributional feedback. Although the three feedback conditions did not differ in rate of problem solving, ability feedback alone led to the highest self-efficacy and achievement. In Experiment 2, children pursued either difficult or easier performance goals, and received either direct or comparative attainment information. Difficult goals enhanced rate of problem solving; combining difficult goals with direct information resulted in the highest self-efficacy and skill. Collectively, these results support the idea that self-efficacy is an important variable in understanding students' achievement behavior.

Self-Efficacy Enhancement Through Motivational and Informational Processes

According to Bandura's theory of self-efficacy (Bandura, 1977a, 1981, 1982), psychological procedures change behavior in part by creating and strengthening percepts of self-efficacy. Self-efficacy refers to personal judgments of how well one can organize and implement actions in specific situations that may contain ambiguous, unpredictable, and possibly stressful elements. Self-efficacy can affect choice of activities, effort expenditure, and perseverance in the face of difficulties. People gain information about their level of efficacy from performance attainments, socially comparative vicarious influences, verbal persuasion, and physiological indices.

Results of a series of studies support the idea that self-efficacy is an important variable in understanding students' achievement behavior (Schunk, 1981, 1982, 1983, Note 1). Students can gain efficacy information in many ways. The means by which they do, however, can produce different levels of motivation and self-perceptions of competence. For example, attributional theories of behavior postulate that individuals make causal ascriptions for the outcomes of their actions (Heider, 1958; Kelley, 1967; Kelley & Michela, 1980). In achievement contexts, outcomes often are attributed to ability, effort, task difficulty, or luck (Frieze, 1980; Weiner, 1977, 1979; Weiner et al., 1971). Future expectancies of success and failure result in part from causal ascriptions (Weiner, 1977, 1979).

Several studies have attempted to modify children's achievement behavior by providing effort or ability attributional feedback for their performances (Andrews & Debus, 1978; Chapin & Dyck, 1976; Dweck, 1975; Medway & Venino, 1982; Miller, Brickman, & Bolen, 1975; Schunk, 1982). Attributional feedback

constitutes a persuasory source of efficacy information. As children engage in a task and observe their progress they begin to develop a sense of efficacy. Telling them that ability or effort is the reason for their success should help validate their perceptions of progress and convey that they are developing competence; however, developmental evidence shows that children gradually differentiate the concepts of ability and effort (Nicholls, 1978). Young children view effort as the prime cause of outcomes and ability-related terms as closely associated with effort. Once these concepts begin to differentiate, we might expect important differences in how these two types of feedback affect self-efficacy. Attribution research shows that success attained with low effort fosters ability attributions, whereas the same level of success resulting from greater effort implies a lower ability level (Frieze, 1980; McMahan, 1973; Weiner, 1979). Because success attained with less effort promotes self-efficacy more than when greater effort is required (Bandura, 1981), ability feedback should enhance self-efficacy more than effort feedback.

The first experiment tested this hypothesis. Children who lacked subtraction skills participated in a competency-development program and periodically received either ability attributional feedback for their progress, effort feedback, ability + effort feedback, or no attributional feedback. Attributional feedback was expected to enhance task motivation more than no feedback. Within the feedback conditions, however, ability feedback alone was expected to exert the greatest benefits on self-efficacy. Children in the effort and ability + effort conditions were expected to view their effort expenditure as greater and thereby perceive themselves as somewhat less competent.

Another motivational mechanism and means of acquiring efficacy information is goal setting. Motivation is enhanced through an internal comparison of a goal against present performance level (Bandura, 1977b). The anticipated satisfaction of attaining the goal helps to sustain efforts toward improvement.

At the same time, as students observe their progress toward a goal they begin to develop a sense of efficacy.

One important goal property is difficulty level (Latham & Yukl, 1975; Locke, 1968; Locke, Shaw, Saari, & Latham, 1981). Goal difficulty refers to level of task proficiency as assessed against a standard. Assuming that students have sufficient ability to accomplish a goal, there is evidence demonstrating a positive and linear relationship between difficulty level and task performance (Locke et al., 1981).

For difficult goals to enhance performance, persons must believe that they can attain them (Locke et al., 1981). One means of providing attainment information is through social comparison. There is evidence that elementary-school children increasingly use comparative information in forming self-evaluations of competence (Ruble, Boggiano, Feldman, & Loebl, 1980; Ruble, Feldman, & Boggiano, 1976; Veroff, 1969). Telling children how other children perform constitutes a vicarious source of efficacy information (Bandura, 1981). As such, children are apt to believe that they can attain the goal too, which helps to sustain their motivation toward the goal. In turn, their perception of progress is informative of increasing competence.

In the second study, children received division performance goals that either were difficult or easier to attain. Within each of these conditions, half of the children were given social comparative information that other similar children could attain the goals. By implication, this information conveyed that the present sample also could attain them. It was decided to include a second attainment condition that eliminated the inferential step; accordingly, the other half were told directly that they could attain the goals. Difficult goals were expected to enhance task motivation and self-efficacy more than easier goals. No hypothesis was advanced on whether the two forms of attainment information would differ, because there was no

clear rationale for predicting that children would use one form in a more self-evaluative fashion than the other.

Experiment 1

Method

Children (N = 44, M = 8.8 years) were nominated by their teachers as lacking subtraction skills. These children individually were administered a pretest, which consisted of an efficacy assessment and a subtraction test.

Children's self-efficacy for solving subtraction problems correctly was measured following procedures of previous research (Bandura & Schunk, 1981; Schunk, 1981, 1982, 1983). The efficacy scale ranged from 10 to 100 in 10-unit intervals from high uncertainty (10), through intermediate values (50-60), to complete certitude (100). Children were shown 25 sample problem pairs briefly, which allowed assessment of difficulty but not solutions. The two members of each pair were similar in form and operations required, and corresponded to one problem on the ensuing subtraction test but were not identical. For each pair, children privately judged their certainty of solving correctly the type of problem depicted.

The subtraction test was administered next. It included 25 problems ranging from 2 to 6 columns that tapped one of the following operations: no borrowing, borrowing once, borrowing from a one, borrowing twice, borrowing caused by a zero, and borrowing across zeros. The tester presented the problems one at a time and advised children to turn the page over when they finished solving the problem or chose not to work on it any longer. Children received no performance feedback. The tester also recorded the time children spent on the problems.

Children then were randomly assigned to one of four conditions (ns = 11) according to a 2(Ability Attributional Feedback: given - not given) x 2(Effort Attributional Feedback: given - not given) factorial design. All children

received three. 40-minute training sessions over consecutive school days during which they worked on a training packet consisting of seven sets of material ordered as follows: no borrowing, borrowing once in 2-column problems, borrowing once in 3-column problems, borrowing once caused by a zero, borrowing twice, borrowing from a one, and borrowing across zeros (Friend & Burton, 1981). Each set contained a brief written explanation with step-by-step worked examples, followed by six pages of problems to solve. An adult proctor reviewed the first explanatory page and instructed children to work the six pages of problems and that whenever they came to a similar explanatory page to bring it to the proctor to review. The proctor then moved out-of-sight. Children solved problems alone and received no feedback on the accuracy of their work.

The proctor monitored the progress of each child every 8 minutes during each session by walking up and asking, "What page are you working on?", after which children replied with the page number. To children receiving ability feedback, the proctor remarked, "You're good at this," and departed. This remark was given matter-of-factly and without accompanying social reinforcement, such as smiles or pats. To children receiving effort feedback, the proctor remarked, "You've been working hard." Children in the ability + effort condition received both remarks each time, but their order was alternated successively to eliminate potential bias. Children in the no-feedback condition were told, "OK," to control for the potential influence of feedback apart from the attribution it conveyed.

Immediately following the last training session, children's perceptions of the amount of effort they expended during the training sessions were assessed. Children privately judged how hard they thought they had worked on a 10-unit (10-100) scale ranging from "not hard" to "really hard". The posttest was administered the day after the last training session. It was similar to the pretest but included a parallel form of the subtraction test.

Results

Means and standard deviations are presented in Table 1. Preliminary ANOVAs revealed no significant differences due to tester, classroom, or sex of child, on any measure, nor did experimental conditions differ on any pretest measure. Posttest measures were analyzed according to a 2(Ability Feedback) x 2(Effort Feedback) ANCOVA using the appropriate pretest measure as the covariate.

Insert Table 1 about here

ANCOVA yielded a significant effect on the skill measure for Ability Feedback ($p < .001$), and a significant Ability x Effort interaction ($p < .001$). Post-hoc comparisons showed that ability feedback alone led to the highest level of skill ($p < .01$). The two conditions receiving effort feedback did not differ, but each demonstrated significantly ($p < .05$) higher skill than did the no-feedback condition. This same pattern of results was obtained for the efficacy measure. The persistence measure yielded nonsignificant results.

To investigate how experimental treatments affected task motivation, an ANOVA was applied to the number of problems that children completed during training. This analysis revealed a significant effect for Effort Feedback ($p < .05$) and a significant Ability x Effort interaction ($p < .05$). The three atributional feedback conditions did not differ, but each completed more problems than the no-feedback condition. Training progress was not attained at the expense of accuracy; similar results were found using the number of problems solved correctly.

Analysis of the effort expenditure measure yielded a significant effect for Effort Feedback ($p < .01$), and a significant Ability x Effort interaction ($p < .05$). The two conditions that received effort feedback did not differ, but each judged effort expenditure higher than ability-feedback ($p < .05$) and no-feedback ($p < .01$) children.

Experiment 2

Method

These procedures were similar to those of the prior experiment. Teachers nominated 40 children (M = 10.0 years) who displayed deficiencies in division. The division test included 14 problems: 6 with 1-digit divisors, 5 with 2-digits, 3 with 3-digits. Of these, 10 required "bringing down" numbers, and all had remainders.

Following pretesting, children were assigned randomly to one of four treatment conditions (ns = 10) according to a 2(Goal Difficulty: high - low) x 2(Attainment Information: comparative - direct) factorial design, and participated in two, 45-minute training sessions. These sessions also utilized packets, except that the first session was devoted entirely to 1-digit divisors whereas the second session covered 2-digit divisors. The proctor reviewed the explanatory page, gave the appropriate experimental instruction, and departed. Children worked problems alone and received no performance feedback.

To children receiving high-difficulty goals, the proctor suggested at the start of the first session that they consider trying to finish 25 problems (second session goal = 15 problems). These numbers were derived from pilot work, which showed that children could complete that amount of work with diligent effort. The goals suggested to low-difficulty children were 15 and 10 problems, respectively. To children receiving comparative information,

the proctor then stated, "I've worked with a lot of other children just like you and what I find is that they can work (number) problems," where the number matched the goal. Direct-attainment information subjects were instead told, "You can work (number) problems."

Childrens' perceptions of goal difficulty were assessed immediately following the second training session. Children privately judged how hard they thought the training session goals had been to attain on a 10-unit scale ranging from "really easy" to "really hard". A posttest comparable to the pretest was given the day following the last training session.

Results

Means and standard deviations are portrayed in Table 2. Data were analyzed in similar fashion as in the preceding study.

Insert Table 2 about here

ANCOVA of division skill yielded a significant effect for Goal Difficulty ($p < .05$) and a Goal Difficulty x Attainment Information interaction ($p < .05$). Post-hoc comparisons showed that the high-direct condition exhibited significantly ($p < .05$) higher skill than the low-direct condition; the remaining comparisons were not significant. The persistence measure yielded nonsignificant rerults.

For the self-efficacy measure, a significant effect ($p < .05$) for Attainment Information was obtained. High-direct children judged efficacy significantly ($p< .05$) higher that did high-comparative and low-comparative subjects.

Children's rate of problem solving during training was enhanced by goal difficulty ($p < .05$). The two high-difficulty conditions did not differ, but each completed significantly ($p < .05$) more problems than did children in the two low-difficulty groups. Similar findings were obtained using the number of problems solved correctly.

ANOVA of the goal difficulty judgments yielded a significant main effect for Goal Difficulty ($p < .01$). Children in the high-difficulty conditions did not differ, but each judged goal attainment as significantly ($p < .01$) more difficult than did subjects in the two low-difficulty groups.

General Discussion

Experiment 1 demonstrates that providing attributional feedback to children in the context of competency development constitutes an effective means of promoting rapid problem solving, self-efficacy, and achievement. As children observe their problem-solving progress during training they begin to develop a sense of efficacy. Attributional feedback helps to support their self-perceptions of progress and validate their sense of efficacy (Schunk, 1982). A heightened sense of erficacy sustains task motivation, which leads to greater skill acquisition.

At the same time, ability feedback alone exerted the greatest benefits on self-efficacy and achievement. The present subjects likely were in a stage of transition from essentially viewing ability and effort as synonymous to differentiating these concepts (Nicholls, 1978). With development, ability assumes greater importance in explaining success, whereas effort becomes less important (Nicholls, 1979). The present effort-only and ability + effort subjects judged they expended greater effort than ability-only children. The same degree of success obtained with less effort should strengthen self-efficacy more than when greater effort is required (Bandura, 1981).

Experiment 2 showed that suggesting more difficult goals led to more rapid problem solving, which is consistent with goal-setting theory and research (Locke, 1968; Locke et al., 1981). Although the present goals--by themselves--conveyed nothing about difficulty of attainment, children received information indicating that they were attainable, which should have produced expectations for success. People are more apt to accept goals when they believe they can attain them, and such acceptance is necessary for goals to influence performance (Locke et al., 1981; Mento, Cartledge & Locke, 1980).

But more difficult goals did not translate automatically into high self-efficacy; direct attainment information was more effective than comparative

information. Children may have believed that the comparative performance represented average achievement and therefore an intermediate-difficulty task. As such, they would have had no reason to feel overly competent even if they matched the comparative level, especially because this required concerted effort. Because the direct attainment information conveyed nothing about other children's accomplishments, these subjects may have focused more on how their present progress surpassed their prior attainments, which would be expected to boost self-efficacy.

Collectively, the results of these studies support the idea that self-efficacy is an important variable in understanding children's achievement behavior. Within this context, however, the means by which children acquire efficacy information may produce different levels of motivation and self-perceptions of competence. Task engagement by itself conveys some efficacy information, but with little or no feedback on the accuracy of their work children may be unsure of how competent they are. Although attributional feedback is informative of children's progress, the form in which it is cast can convey different types of information about level of competence. Different goal properties do not motivate task performance equally well nor convey identical efficacy information. The same is true for forms of attainment information.

This research has practical significance as well. These procedures were implemented with school subjects in a didactic instructional setting. Teachers of young children often provide them with attributional feedback, goals, and attainment information. Knowing how these procedures affect children should help teachers in their planning to enhance children's achievement and sense of efficacy.

Reference Note

1. Schunk, D. H. Self-efficacy perspective on achievement behavior. Paper presented at the annual meeting of the American Psychological Association, Washington, August 1982.

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Experiment 1

Pre- and Posttest Means (and Standard Deviations)

Measure	Phase	Experimental Condition			
		Ability Feedback	Effort Feedback	Ability + Effort	No Feedback
Skill[a]	Pretest	4.5 (5.5)	4.5 (4.9)	4.6 (4.0)	4.3 (5.6)
	Posttest	18.8 (3.7)	13.2 (3.3)	12.6 (6.3)	8.0 (4.7)
Persistence[b]	Pretest	47.5 (18.3)	48.1 (20.1)	53.2 (15.8)	46.8 (20.7)
	Posttest	43.0 (18.3)	43.0 (22.8)	45.0 (15.8)	43.1 (8.8)
Self-efficacy[c]	Pretest	39.6 (15.9)	37.1 (13.3)	35.8 (17.1)	36.5 (13.4)
	Posttest	80.9 (13.8)	60.4 (17.4)	60.0 (26.6)	43.3 (9.8)
Training progress[d]	----	212.3 (36.3)	224.3 (50.4)	205.6 (59.5)	158.4 (43.6)
Effort expenditure[e]	----	57.0 (9.7)	78.7 (12.7)	74.3 (14.3)	42.2 (15.1)

Note. N = 44; ns = 11.

[a]Number of correct solutions on 25 problems.

[b]Average number of sec per problem.

[c]Average judgment per problem; range of scale: 10(low) - 100.

[d]Number of problems completed.

[e]Range of scale: 10(low) - 100.

Experiment 2

Pre- and Posttest Means (and Standard Deviations)

Measure	Phase	Experimental Condition[a]			
		High-Comparative	High-Direct	Low-Comparative	Low-Direct
Skill[b]	Pretest	3.4 (3.5)	2.8 (2.8)	3.0 (2.5)	2.6 (2.2)
	Posttest	7.9 (3.8)	10.6 (2.1)	8.3 (4.2)	6.6 (3.7)
Persistence[c]	Pretest	60.8 (41.4)	61.4 (47.6)	90.1 (50.4)	102.1 (68.3)
	Posttest	83.9 (54.6)	89.3 (42.7)	109.9 (49.3)	113.6 (55.2)
Self-Efficacy[d]	Pretest	30.2 (14.3)	35.9 (23.2)	33.9 (18.7)	32.9 (20.3)
	Posttest	52.7 (26.3)	78.5 (22.5)	53.1 (25.0)	61.3 (22.3)
Training Progress[e]	------	62.9 (23.5)	59.0 (24.4)	39.2 (17.8)	33.5 (18.2)
Goal Difficulty[f]	------	78.7 (14.6)	83.6 (18.7)	36.5 (16.9)	31.3 (13.3)

Note. N = 40; ns = 10.

[a]The first descriptor refers to the level of goal difficulty; the second to the type of attainment information.

[b]Number of correct solutions on 14 problems.

[c]Average number of sec per problem.

[d]Average judgment per problem; range of scale 10 (low) - 100.

[e]Number of problems worked.

[f]Range of scale 10 (low) - 100.